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1-1-2007

## Precast Inverted T Beam

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DOI: 10.5703/1288284315742

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### Recommended Citation

ECT Team, Purdue, "Precast Inverted T Beam" (2007). *ECT Fact Sheets*. Paper 33.  
<http://dx.doi.org/10.5703/1288284315742>

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## PRECAST INVERTED 'T' BEAM

### THE NEED

Current systems are either costly or time consuming to erect and have limitations. Cast-in-place slabs have become too expensive and time-consuming due to extensive field formwork. Precast solid slabs aren't economical for spans longer than 9 meters. I-girders with concrete deck slab topping can span longer than other systems, but require field formwork and significantly higher clearance. The new precast concrete product for short to medium span bridges was developed by the University of Nebraska. The Nebraska Inverted Tee (IT) can span up to 26 meters with a total structural depth of 725 mm. Most U.S. highway bridges have short to medium span lengths. And most bridges needing rehabilitation or replacement are short-span. A recently developed type of pre-stressed concrete beam is helping slash 20% off the weight of a bridge being built in Florida between the cities of Boynton Beach and Ocean Ridge.

### THE TECHNOLOGY

The Nebraska Inverted Tee (IT) system was designed for use by small contractors in sparsely populated areas where relatively modest erection equipment exists. The ITs were developed in "hard" metric units, i.e., using round-figure millimeters. The ITs are 600 mm (23.5 in) wide. They vary in depth as needed for design, using a single set of formwork. Through analytical and experimental testing, researchers have shown that the system can span up to 25.9 m (85 ft) with a total structural depth of 725 mm (28.5 in). Researchers conducted a full-scale test of two 400 mm (15.7 in) deep ITs with CIP topping at the Structures Laboratory at the University of Nebraska-Lincoln. Test results confirmed that available design procedures are sufficient for the design of this new system. It's an I-beam without a top flange. The goal was to build precast short-span bridges with shallow profiles, eliminating need for heavy equipment and casting on site, yet still load-bearing.

### THE BENEFITS

No other existing precast concrete or cast-in-place conventionally reinforced system has this capability. The only CIP system that has a similar span/depth ratio is post-tensioned slabs, which are relatively complicated to design and expensive to build.

- Cost-competitive: Less expensive



- Easier to erect than traditional concrete slabs.
- Does not require site formwork.
- Faster to build than a cast-in-place conventionally reinforced slab bridge, while the structural depth was maintained in the same range as for slab bridges.
- Its weight is suitable for county bridges where contractors do not have heavy lifting equipment.
- Favorably compete with existing systems used for short to medium span bridges, especially cast-in-place slabs.



**FIGURE 1 DEVELOPED IN NEBRASKA, A PRECAST INVERTED T-BEAM  
SAVES UP TO 20% IN WEIGHT OFF STANDARD I-BEAMS**

## STATUS

The inverted T-beam was initially developed at the University of Nebraska under a fellowship four years ago in conjunction with the Nebraska Dept. of Roads. Nebraska has since built six and Iowa has built three. The three-span 111-meter-long Boyton Beach bridge in Florida may be the longest yet to use T beams. The Florida Dept. of Transportation decided to use the T-beams to replace the nearly century-old bridge. Nebraska Department of Roads' and UNL engineers designed a 120 ft inverted tee bridge over Wolf Creek near Syracuse, Nebraska. This new three-span structure is a twin bridge that was constructed next to an existing bridge. Construction was complete in 1997. Lamp Rynearson & Associates, Omaha, is designing the Dahlman Avenue Bridge for the City of Omaha using the IT system.



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2. Center of Infrastructure Research, University of Nebraska - Lincoln.

## REVIEWERS

Peer reviewed as an emerging construction technology

## DISCLAIMER

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## PUBLISHER

Emerging Construction Technologies, Division of Construction Engineering and Management, Purdue University, West Lafayette, Indiana